

Willingness to Pay in Dermatology: Assessment of the Burden of Skin Diseases

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Willingness to pay (WTP) is a monetary, preference-based, burden-of-disease measure with a potential role in dermatology, where many conditions are temporary and/or mild, and many treatments are inexpensive and one might be able to imagine paying out of pocket. We assessed construct validity by interviewing 254 consecutive dermatology patients at Stanford Medical Center, Grady Hospital, and Parkland Hospital. Instruments asked about an individual's own health status and elicited WTP, time-trade-off (TTO) utilities, and health status quality of life (QOL). We measured WTP cure (short treatment course to eliminate disease) and WTP control (lifelong medication). Our data indicate greater construct validity in non-Medicaid ($n=163$) than Medicaid ($n=91$) patients. Non-Medicaid subjects had greater WTP as percent of income for cure (median: 2%) than control (median: 1.6%), $P<0.01$; Medicaid WTP amounts for control and cure did not differ. Non-Medicaid subjects with verrucae had little QOL impact, no measurable burden by TTO, and a correspondingly low WTP. Medicaid subjects with basal cell carcinoma had a strong, negative QOL impact and high burden by TTO, but had relatively moderate WTP. WTP appears promising in certain income categories. More studies are needed for conclusions about specific diagnoses.

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INTRODUCTION

A goal of the dermatology community is to quantify the burden of skin disease by measures of prevalence, quality of life (QOL), and costs of illness (Chen *et al.*, 2004). There are various measures for assessing QOL impact, including descriptive and detailed health status instruments, such as the Skindex (Chren *et al.*, 1997); utilities derived from techniques such as standard gamble or time-trade-off (TTO) methods; and the willingness-to-pay (WTP) metric. Health status instruments are actively explored in the literature and

data regarding utilities are emerging, but exploration of WTP in dermatology is in its infancy.

WTP is a measure of disease burden that may be acquired by directly asking patients what amounts they would be willing to pay to rid themselves of their own specific health condition. WTP is distinct from a utility, which is also a measure of disease burden, because WTP is based on contingent valuation whereby units are expressed in monetary terms. Contingent valuation aims to provide a market value to nonmarket goods, such as health status. The WTP method is theoretically advantageous over utilities in so-called minor health states, because asking patients to consider paying relatively small amounts of money may be more intuitive than asking them to contemplate trading time from their life expectancy (as in one method of calculating utilities).

Our purpose is to introduce WTP across a variety of skin diseases to the dermatology community. We prospectively gathered WTP data directly from subjects with a variety of skin diseases to collect a repository of WTP amounts. We then performed *post hoc* subjective analyses to assess construct validity, defined as the ability of WTP to measure the disease burden it purports to measure. We assessed whether WTP responses seemed meaningful, based on QOL impact (as measured by the Skindex questionnaire) and TTO utility responses. We assumed that individuals with little discretionary income, in subsidized programs, would not be as accustomed to payment decisions that WTP aims to capture. Accordingly, we separated subjects eligible for Medicaid based on their income from the rest of the sample with greater income levels for the analyses.

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Abbreviations: QOL, quality of life; TTO, time trade off; WTP, willingness to pay

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RESULTS

Sample

We recruited a total of 283 subjects: 77 from Grady Hospital, 106 from Stanford Medical Center, and 100 from Parkland Hospital. The proportion of subjects approached who agreed to be interviewed by site was 97% at Grady, 25% at Stanford, and 67% at Parkland. A language barrier was the most common reason for declining at Parkland. Patients at Grady (a safety-net institution serving low-income patients) were willing to donate 20–30 minutes of their time for an interview, whereas at Stanford the patients were much less willing to spend their time participating in an interview. We eliminated eight participants from Grady who did not complete the TTO questions and four additional subjects (three from Stanford and one from Grady) who gave inconsistent responses to the utility questions. For example, some subjects indicated that

their health utility for all illnesses was greater than their skin-only utility. We eliminated six additional subjects from Stanford who were willing to pay a one-time amount for cure exceeding their total annual income. Finally, we eliminated 11 subjects with multiple skin diagnoses (three from Grady, seven from Stanford, and one from Parkland) because our goal was to distinguish WTP amounts by individual diagnoses. Accordingly, our final analyses were based on data from 254 subjects (65 from Grady, 90 from Stanford, and 99 from Parkland).

Demographics and descriptives

Demographic and descriptive information is displayed in Table 1 according to income because WTP values may vary by ability to pay (Bala *et al.*, 1999a). The methods section provides an explanation of the meaning of symptom/emotion/function scores. The majority of our patient sample (64%) had

Table 1. Demographics and descriptives for entire patient sample and by income group

N (% sample)	All income groups 254 (100%)	Income ≤\$10,070 91 (36%)	Income >\$10,070 163 (64%)
<i>Demographics</i>			
Age: median (IQR)	45 (35, 58)	45 (35, 59)	44 (33, 58)
Income: median (IQR)	\$15,000 (\$7,500, \$50,000)	\$7,500 (\$5,000, \$7,500)	\$35,000 (\$15,000, \$85,000)
Gender: N (% sample)			
1: Male	1: 113 (44)	1: 33 (36)	1: 80 (49) ¹
Race: N (% sample)			
1: Non-white	1: 125 (49)	1: 61 (67)	1: 64 (39) ²
Education (highest level completed): N (% sample)			
1: Grade school	1: 13 (5)	1: 8 (9)	1: 5 (3) ³
2: High school	2: 109 (43)	2: 64 (70)	2: 45 (28)
3: College	3: 73 (29)	3: 14 (15)	3: 59 (36)
4: Graduate school	4: 53 (21)	4: 2 (2)	4: 51 (31)
5: Unknown	5: 6 (2)	5: 3 (3)	5: 3 (2)
<i>Descriptives: median (IQR)</i>			
WTP cure			
1: One-time amount	1: \$300 (\$100, \$2,000)	1: \$100 (\$50, \$200)	1: \$1,000 (\$200, \$5,000) ²
2: Percent of annual income	2: 1.63 (0.67, 6.10)	2: 1.33 (0.67, 4.00)	2: 2.00 (0.67, 8.00)
WTP control			
1: Monthly amount	1: \$30 (\$16, \$100)	1: \$20 (\$10, \$30)	1: \$50 (\$25, \$100) ²
2: Percent of annual income	2: 2.40 (0.72, 4.80)	2: 4.80 (2.40, 7.20)	2: 1.60 (0.48, 4.00) ²
Utility	1.00 (0.94, 1.00)	1.00 (0.86, 1.00)	1.00 (0.97, 1.00) ¹
Symptom	0.68 (0.50, 0.86)	0.61 (0.46, 0.82)	0.71 (0.54, 0.89) ²
Emotion	0.72 (0.50, 0.85)	0.69 (0.47, 0.81)	0.72 (0.50, 0.85)
Function	0.92 (0.73, 1.00)	0.88 (0.73, 1.00)	0.92 (0.73, 1.00)

Abbreviation: IQR, interquartile range.

¹ $P < 0.05$ by Mann-Whitney *U*-test.

² $P < 0.01$ by Mann-Whitney *U*-test.

³ $P < 0.01$ by Pearson χ^2 -test for independence of proportions.

an annual household income exceeding \$10,070, and thus was not eligible for Medicaid. We will refer to this group as the non-Medicaid group. We will refer to patients with annual household incomes of \leq \$10,070 as the Medicaid group, as these patients were eligible for the Medicaid program at the time of data acquisition.

The non-Medicaid group consisted of a greater proportion of subjects who were male and white than the Medicaid group ($P<0.05$); there was no significant difference by age. The Medicaid group had more subjects who did not attend college ($P<0.01$). The non-Medicaid group had greater absolute values of WTP control and WTP cure but had greater TTO utility ($P<0.05$), indicating less burden of disease. Utility, symptom, emotion, and function by income group are presented in Figure 1a–d. The non-Medicaid group had less symptomatic impact ($P<0.01$). When WTP control and cure were calculated as proportions of annual income, the Medicaid group had a greater WTP control than the non-Medicaid group (median: 4.80 vs. 1.60, $P<0.0001$), but there was no significant difference between the Medicaid and non-Medicaid groups in WTP cure (median: 1.33 vs. 2.00, $P=0.369$). There were only four subjects with WTP values of \$0 for cure (three non-Medicaid and one Medicaid). Twelve subjects had WTP values of \$0 for control (seven non-Medicaid and five Medicaid).

Diagnosis

Our patient sample was representative of over 80 diagnoses, but we report descriptive data for 8 diagnoses that included at least 5 patients. These diagnoses are represented in Table 2a and b, by income category ($>$ \$10,070 or \leq \$10,070), and together they account for 34% of our sample. Specific diagnoses with fewer than five patients included varicosities, vitiligo, rosacea, pemphigus vulgaris, sarcoidosis, melasma, lichen planus, dyshidrosis, and alopecia among many others.

WTP construct validity

On the individual level, WTP control was never reported greater than WTP cure in either income group. Eleven subjects had equal WTP cure and WTP control amounts. It is noteworthy that when all income groups and all diseases were considered ($n=254$) there was no significant difference between WTP cure (median: 1.63%) and WTP control (median: 2.40%) amounts as percentages of annual income ($P=0.877$).

Non-Medicaid sample

Patients with verrucae had the least QOL impact as reflected by relatively high Skindex scores (Table 2a). They also had a median utility of 1, indicating little, if any, preference for another state. Correspondingly, this group of patients had the lowest relative WTP cure amounts as a percentage of annual income. On the other extreme, patients with psoriasis had the most QOL impact by Skindex measures and the greatest burden of disease by TTO utility. Psoriasis patients had the highest WTP control amounts; the WTP cure was relatively large as well, second only to the WTP cure amount for actinic keratosis. The actinic keratosis group had a relatively high

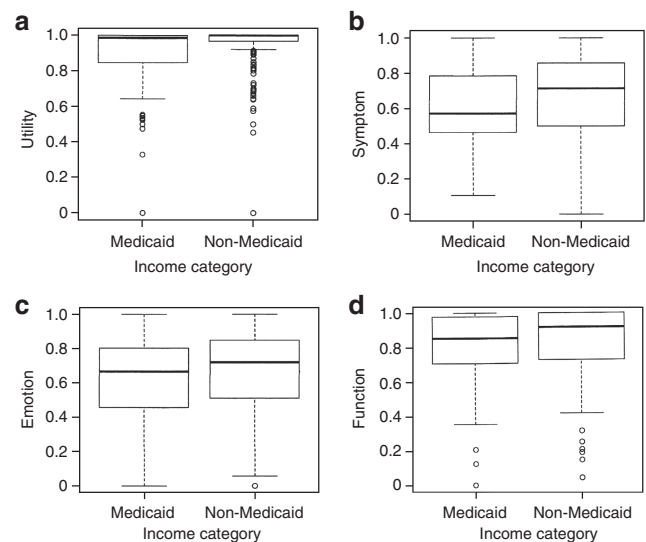


Figure 1. QOL Skindex measures by income group. (a–d) Utility, symptom, emotion, and function by income group.

WTP cure, but this group was relatively unwilling to pay a large amount for control of these premalignant lesions.

Medicaid sample

Patients with basal cell carcinoma had the least QOL impact by Skindex scores (Table 2b). However, the utility value was relatively low, indicating greater preference for another state, and the WTP control and cure amounts as percentages of income were relatively moderate. Patients with acne had the greatest QOL impact by Skindex. However, the TTO utility value was 1, indicating little to no preference for another state, and the WTP cure amount was low.

DISCUSSION

WTP appears to be a promising measure of the burden of skin disease. We found that all subjects responded that their WTP cure was greater than WTP control, as anticipated, except the 11 subjects who gave equal values for control and cure. Our preliminary data indicate that WTP may have greater construct validity for non-Medicaid patients than Medicaid patients. Our *post hoc* assessment of the meaningfulness of WTP responses, given the corresponding QOL impact and TTO utilities, revealed that WTP responses from the non-Medicaid group were consistent with our expectations of these amounts, whereas responses from the Medicaid group were inconsistent.

We anticipated that patients with the greatest QOL impact from their skin disease would be willing to pay the most to either control or cure their disease, and we witnessed the expected responses in non-Medicaid subjects. The WTP responses from the Medicaid group differed from the anticipated amounts from corresponding TTO utility and QOL measures. For example, psoriasis subjects had greater emotional and functional impact than eczema patients, but were willing to pay relatively less for a cure.

Our study has relevant limitations. The small number of subjects when divided by diagnosis limited our analyses.

Table 2. (a) Non-Medicaid patients and (b) Medicaid patients

		WTP as % of income median (IQR)		Skindex median (IQR)		
Income > \$10,070	TTO median (IQR)	Control	Cure	Symptom	Emotion	Function
(a)						
Acne (n=24)	1.00 (0.98, 1.00)	2.00 (0.59, 4.27)	1.63 (0.67, 6.32)	0.75 (0.65, 0.85)	0.62 (0.46, 0.75)	0.92 (0.76, 1.00)
Psoriasis (n=8)	0.95 (0.67, 1.00)	3.20 (1.71, 8.26)	9.88 (1.83, 58.57)	0.41 (0.19, 0.64)	0.44 (0.06, 0.78)	0.54 (0.30, 0.93)
Actinic keratosis (n=7)	1.00 (0.83, 1.00)	0.60 (0.21, 2.67)	11.11 (5.71, 24.00)	0.82 (0.57, 1.00)	0.75 (0.68, 0.95)	1.00 (0.88, 1.00)
Epidermoid cyst (n=5)	0.99 (0.96, 1.00)	0.96 (0.48, 6.80)	2.00 (0.60, 5.33)	0.86 (0.79, 0.93)	0.72 (0.66, 0.89)	1.00 (0.74, 1.00)
Verrucae (n=6)	1.00 (0.96, 1.00)	0.92 (0.24, 4.00)	0.89 (0.46, 1.47)	0.93 (0.74, 1.00)	0.96 (0.81, 1.00)	1.00 (0.91, 1.00)
(b)						
Acne (n=6)	1.00 (0.88, 1.00)	3.60 (1.20, 24.00)	1.07 (0.20, 6.00)	0.46 (0.35, 0.63)	0.54 (0.09, 0.74)	0.73 (0.67, 0.89)
Psoriasis (n=15)	0.93 (0.75, 1.00)	3.20 (0.80, 7.20)	1.33 (0.67, 4.00)	0.46 (0.39, 0.64)	0.58 (0.47, 0.81)	0.75 (0.71, 0.92)
Eczema (n=6)	1.00 (0.98, 1.00)	3.60 (1.80, 26.70)	2.33 (0.47, 13.50)	0.43 (0.32, 0.65)	0.69 (0.40, 0.92)	0.92 (0.85, 0.97)
Contact dermatitis (n=5)	0.98 (0.67, 1.00)	7.20 (4.80, 20.00)	2.67 (0.97, 76.67)	0.54 (0.30, 0.66)	0.72 (0.50, 0.81)	0.83 (0.74, 0.84)
Basal cell carcinoma (n=5)	0.95 (0.88, 1.00)	4.80 (1.40, 8.40)	1.33 (0.97, 16.33)	0.57 (0.45, 0.77)	0.72 (0.61, 0.93)	0.94 (0.81, 1.00)

Abbreviations: IQR, interquartile range; TTO, time trade off; WTP, willingness to pay.
Burden of skin disease by specific diagnosis (groups included had $n \geq 5$ patients).

There may be other factors that influenced the WTP responses, such as age, gender, or duration of disease, which we did not explore in this study. Further, these factors could have differed between the Medicaid and non-Medicaid subjects with a given disease, and could account for the differences in responses we saw in these groups. Future studies should evaluate the influence of these other variables on WTP responses. Second, our patient sample may have been subject to selection bias, as it comprised individuals who agreed to an interview lasting 20–30 minutes, and their personal characteristics may have differed from the population as a whole or they may have had more significant disease burden than those who were not willing to donate time for an interview.

We calculated correlation coefficients for WTP and utilities that were low as expected; however, we do not present these data here, as it contributes little to the evaluation of whether WTP is a meaningful measure of disease burden for many reasons. WTP and utilities are different currencies. As a contingent valuation measure expressed in monetary terms, WTP is different, by nature, from utility measures. People feel differently about money they would be willing to pay and time they would be willing to trade from their lives for an improved health status. For instance, some individuals may be willing to pay large sums of money, but would not be interested in trading any time from their lives, because of their perspective on these very different entities. Similarly, another individual may be willing to trade in time from life before spending large sums of money.

Prior work has demonstrated modest correlation, at best, between preference-based measures, including utilities and WTP and health status instruments such as Skindex symptom, emotion, and functional status (Goldstein and Tsevat, 2003). Bala *et al.* (1998) demonstrated that Quality-adjusted life years (a measure that incorporates utilities and life years) and

WTP are weakly correlated, supporting the fact that they may measure different aspects of patient preference. Lundberg *et al.* (1999) examined utilities and WTP in patients with psoriasis and atopic dermatitis. The authors found a weak correlation ($r = -0.133$, $P < 0.05$) between TTO utilities and WTP as assessed by the dichotomous choice method.

Other authors have helped elucidate components of patient preference that may account for weak correlations between WTP and utilities. Bala *et al.* (1999b) demonstrated the importance of the duration of an illness. The authors compared utilities associated with 10 vs. 20 years of shingles pain and demonstrated that a smaller amount of time with the condition yielded less burden of disease (Bala *et al.*, 1999b). Franic *et al.* (2005) examined acute (post-chemotherapy nausea and vomiting) versus chronic (breast cancer) conditions. The authors found limitations in the use of utilities in acute conditions and in the use of WTP in chronic conditions. Enduring a time-limited illness may be preferable to trading time from one's life expectancy. In terms of a chronic condition, the burden may be so extensive that it cannot be effectively captured in monetary terms, particularly because of a lack of experience in funding or even conceptualizing the costs of extensive treatments over time. Accordingly, WTP may be more appropriate for measuring health benefits for acute conditions (Bala and Zarkin, 2000), whereas utilities may be more applicable for assessing burden in chronic conditions.

The interest in WTP as a preference-based measure to inform decision-makers or for other population-based analyses may be characterized as follows. (1) WTP is a measure of QOL that may be incorporated into pharmacoeconomic analyses, such as cost-benefit analyses; (2) WTP can capture aspects of health that patients may consider important, but are not necessarily captured with conventional effectiveness measures (Thompson, 1986; Drummond and Jefferson, 1996;

Olsen and Smith, 2001). For example, WTP may capture a desire for personal attention or other intangible components of the process of care (Drummond and Jefferson, 1996). (3) WTP may account for other aspects of a disease that are difficult to measure, such as disfigurement or fear. (4) As a monetary measure, WTP may be added to conventional calculations of direct costs and loss of productivity included in cost of illness studies (Thompson, 1986). It has been argued that without the inclusion of WTP measures, cost of illness calculations are underestimates of the true economic burden of disease (Landefeld and Seskin, 1982; Goddeeris, 1983).

In summary, our data support the fact that practical applications of the WTP method are likely limited to individuals with incomes above the Medicaid-eligible level. A thorough assessment of the relevance of WTP to specific dermatologic diseases is beyond the scope of this work. Although some dermatologic diseases can be costly or chronic, a significant number of them represent acute or relatively inexpensive conditions that may lend themselves to WTP. Our data indicate that WTP is promising in non-Medicaid patients, given that the responses are subjectively meaningful in the context of other corresponding burden of disease and health status measures in this group. Thus, further work into WTP in dermatology is warranted.

MATERIALS AND METHODS

Subjects and data collection

We refer the reader to the materials and methods section of our previous paper (Chen *et al.*, 2004), as the data for the current study were derived from the same patient population. Briefly, subjects were recruited consecutively from general dermatology clinics at Stanford Medical Center (Stanford, CA), Grady Hospital (Atlanta, GA), and Parkland Hospital (Dallas, TX). Institutional Review Board approval was obtained from each institution, and informed consent was obtained from each subject. The investigation was conducted according to the Declaration of Helsinki principles. One interviewer at each site administered all questionnaires, and all interviewers were trained by the author, SCC. Both patients and dermatologists were asked about the specific diagnosis that led to the visit. In cases where the responses conflicted, the response of the dermatologist was used.

Prospective stratification of sample by Medicaid status

We prospectively stratified the analyses according to Medicaid status for the following reasons. We hypothesized that people on subsidized programs may not be accustomed to paying out of their own funds, and accordingly they may answer the questions about WTP differently from people not on subsidized programs. In addition, we considered that people with little discretionary income might not be willing or able to pay larger amounts of money to improve their health status.

Skin disease severity measurement

Medical records were obtained for all study subjects from Grady Hospital and Stanford Medical Center in order to retrospectively classify skin disease severity on a three-point scale (mild, moderate, and severe). Three practicing dermatologists reviewed the records at the time of the original survey administration. Parkland Hospital charts were unavailable for review for the original cohort, and thus an additional cohort of subjects was recruited from that site. Thus,

the patient sample from Parkland Hospital for the current study differs from that of our previous study (Chen *et al.*, 2004).

Willingness-to-pay elicitation

Subjects were asked about the amount of money they would be willing to pay out of pocket for two hypothetical drugs, one for control (WTP control) and the other for cure (WTP cure) of their skin disease. An open-ended question format was used. For the WTP control question, patients were asked how much they would pay on a monthly basis to control the clinical signs of their skin condition. Patients were instructed that insurance would not cover the costs of the medication, and if they stopped taking their medication their skin condition would recur immediately. The monthly cost of the hypothetical medication was then recorded. The WTP control monthly amount was converted to an annual sum for all patients. The annual WTP control values were divided by the patient's self-reported household income from the past year, for assessment as a percentage of annual income. For the WTP cure question, patients were asked how much they would pay as a one-time cost for an imaginary cure for their skin condition. They were instructed that the hypothetical cure was not covered by insurance and that it had no side effects. WTP cure was also calculated as percentage of annual income. A higher WTP value indicated a higher disease burden.

In Spearman's correlation calculations and the regression analysis, WTP as an absolute value was used.

Skindex questionnaire

The Skindex-29 (Chren *et al.*, 1997) is a previously validated skin-specific health status measure that may be applied to all skin conditions. The questions are grouped into three constructs: symptoms (e.g., pain, pruritus, bleeding, and so on), functional impact (e.g., closeness with loved ones, tendency to stay at home, and so on), and emotional impact (e.g., humiliation, embarrassment, shame, and so on). Each question in the Skindex-29 questionnaire has five answer choices, indicating the level of impact, with 1 as the least and 5 as the most. We converted the Skindex scores to a range from 0 (greatest amount of impact) to 1 (no impact).

Utility elicitation

A detailed description of the utility elicitation is included in our previous study (Chen *et al.*, 2004).

Statistical analysis

Analyses were performed using the Statistical Analysis System software and SPSS version 16.0 for Windows. Medians and interquartile ranges were used for continuous variables describing characteristics of the sample because the distributions were nonparametric. Mann-Whitney *U*-tests were used to compare medians of unrelated samples. Wilcoxon's signed ranks test was used to compare paired data (e.g., WTP control and WTP cure). Proportions were used to describe categorical variables and χ^2 -tests were used to compare group differences. Spearman's correlation coefficients were calculated owing to the nonparametric nature of the data, and *P*-values were calculated as two-tailed tests. All *P*-values <0.05 were considered statistically significant.

CONFLICT OF INTEREST

The authors state no conflict of interest.

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